ILLUSTRATED DICTIONARY of

IMMUNOLOGY

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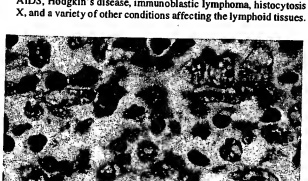
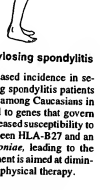
angioimmunoblastic lymphadenopathy (AILA)
Proliferation of hyperimmune B lymphocytes. Immunoblasts, both large and small, form a pleomorphic infiltrate together with plasma cells in lymph nodes revealing architectural effacement. There is arborization of newly formed vessels and proliferating vessels with hyperplasia of endothelial cells. In the interstitium, amorphous eosinophilic PAS positive deposits, possibly representing debris from cells, are found. Fever, night sweats, hepatosplenomegaly, generalized lymphadenopathy, weight loss, hemolytic anemia, polyclonal gammopathy, and skin rashes may characterize the disease in middle-aged to older subjects. Patients live approximately 15 months, with some developing monoclonal gammopathy or immunoblastic lymphomas. AILA must be differentiated from AIDS, Hodgkin's disease, immunoblastic lymphoma, histocytosis X, and a variety of other conditions affecting the lymphoid tissues.



Angioimmunoblastic Lymphadenopathy

angry macrophage
A term sometimes used to refer to activated macrophages.

ankylosing spondylitis
A chronic inflammatory disease affecting the spine, sacroiliac joints, and large peripheral joints. There is a strong male predominance with onset in early adult life. The erythrocyte sedimentation rate is elevated, but subjects are negative for rheumatoid factor and antinuclear antibodies. Pathologically, there is chronic proliferative synovitis which resembles that seen in rheumatoid arthritis. The sacroiliac joints and interspinous and capsular ligaments ossify when the disease advances. There is a major genetic predisposition, as revealed by increased incidence in selected families. Ninety percent of ankylosing spondylitis patients are positive for HLA-B27, compared to 8% among Caucasians in the U.S. The HLA-B27 genes may be linked to genes that govern pathogenic autoimmunity. There may be increased susceptibility to infectious agents or molecular mimicry between HLA-B27 and an infectious agent such as *Klebsiella pneumoniae*, leading to the synthesis of a cross-reacting antibody. Treatment is aimed at diminishing inflammation and pain and providing physical therapy.

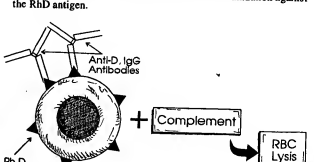


ankylosing spondylitis

ANNA
Abbreviation for anticeutrophil nuclear antibodies.

anti-C1q antibody
Present in the majority of patients with hypocomplementemic urticarial vasculitis syndrome (HUVS) and in 30 to 60% of systemic lupus erythematosus patients. C1q is strikingly decreased in the blood sera of HUVS patients, even though their C1r and C1s levels are within normal limits and C5-C9 are slightly activated.

anti-D
Antibody against the Rh blood group D antigen. This antibody is stimulated in RhD– mothers by fetal RhD+ red blood cells that enter her circulation at parturition. Anti-D antibodies become a problem usually with the third pregnancy, resulting from the booster immune response against the D antigen to which the mother was previously exposed. IgG antibodies pass across the placenta, leading to hemolytic disease of the newborn (erythroblastosis fetalis). Anti-D antibody (Rhogam®) administered up to 72 h following parturition may combine with the RhD+ red blood cells in the mother's circulation, thereby facilitating their removal by the reticuloendothelial system. This prevents maternal immunization against the RhD antigen.



anti-DEX antibodies
Murine α1-3 dextran specific antibodies

anti-I
Antibodies against the I blood group antigen, which is present on the majority of adult red blood cells in man. The Ii antigens are present in the subterminal portions of the oligosaccharides which are ultimately converted to H and A or B antigens. I and i configurations are present on membrane-associated glycoproteins and glycosphingolipids. The heterogeneity observed with different anti-I antisera may reflect the recognition of different parts of the branched oligosaccharide chain. Fetal erythrocytes contain abundant i antigen, but few branched oligosaccharides and little I antigen. The I antigen develops during the first 2 years of life with simultaneous loss of i. Anti-I is a common autoantibody that is frequently present as a cold-reacting agglutinin. Anti-I is of pathologic significance in many cases of CHD when it acts as a complement-binding monoclonal antibody. Autoanti-i is of less significance in cold hemagglutinin disease than is anti-I. Thus, anti-I acting as a cold agglutinin may be detected as an autoantibody in a number of cases of cold antibody type hemolytic anemia and in patients with *Mycoplasma pneumoniae* infection.

anti-phospholipid antibodies
See lupus anticoagulant.

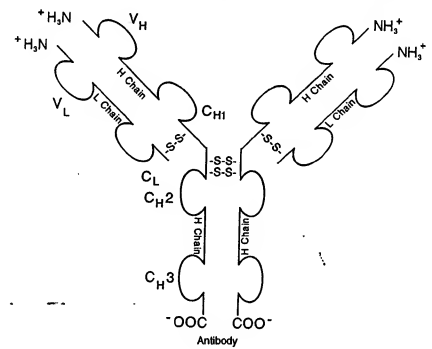
anti-Purkinje cell antibody
An antibody that has been detected in the circulation of subacute cerebellar degeneration patients and in those with ovarian neoplasms and other gynecologic malignancies.

antianaphylaxis
Inhibition of anaphylaxis through desensitization. This is accomplished by repeated injections of the sensitizing agent too minute to produce an anaphylactic reaction.

antiantibody
In addition to their antibody function, immunoglobulin molecules serve as excellent protein immunogens when inoculated into another species or they may become autoantigenic even in their own host. The Gm antigenic determinants in the Fc region of an IgG molecule may elicit autoantibodies, principally of the IgM class, known as rheumatoid factor in individuals with rheumatoid arthritis. Antiidiotypic antibodies, directed against the antigen-binding N-terminal variable regions of antibody molecules, represent another type of antiantibody. Rabbit anti-human IgG (the Coombs' test reagent) is an antiantibody used extensively in clinical immunology to reveal autoantibodies on erythrocytes.

antiagglutinin
A specific antibody that interferes with the action of an agglutinin.

antibodies
Antibodies are glycoprotein substances produced by B lymphoid cells in response to stimulation with an immunogen. They possess the ability to react *in vitro* and *in vivo* specifically and selectively with the antigenic determinants or epitopes eliciting their production or with an antigenic determinant closely related to the homologous antigen. Antibody molecules are immunoglobulins found



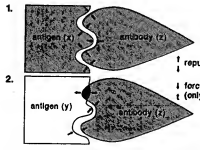
Antibody

in the blood and body fluids. Thus, all antibodies are immunoglobulins formed in response to immunogens. Antibodies may be produced by hybridoma technology in which antibody secreting cells are fused by polyethylene glycol (PEG) treatment with a mutant myeloma cell line. Monoclonal antibodies are widely used in research and diagnostic medicine and have potential in therapy. Antibodies in the blood serum of any given animal species may be grouped according to their physicochemical properties and antigenic characteristics. Immunoglobulins are not restricted to the plasma, but may be found in other body fluids or tissues, such as urine, spinal fluid, lymph nodes, spleen, etc. Immunoglobulins do not include the components of the complement system. Immunoglobulins (antibodies) constitute approximately 1 to 2% of the total serum proteins in health. γGlobulins comprise 11.2 to 20.1% of the total serum content in man. Antibodies are in the γ globulin fraction of serum. Electrophoretically they are the slowest migrating fraction.

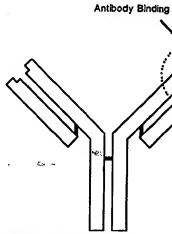
antibody absorption test
A serological assay based upon the ability of a cross-reactive antigen to diminish a serum sample's titer of antibodies against its homologous antigen, i.e., the antigen that stimulated its production. Cross-reactive antibodies, as well as cross-reactive antigens, may be detected in this way.

antibody affinity
The force of binding of one antibody molecule's paratope with its homologous epitope on the antigen molecule. It is a consequence of positive and negative portions affecting these molecular interactions.

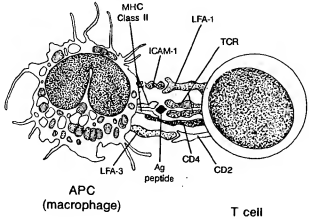
Antibody Affinity



antibody-binding site
The antigen-binding site of an antibody molecule, known as a paratope, that is comprised of heavy chain and light chain variable regions. The paratope represents the site of attachment of an epitope to the antibody molecule. The complementarity-determining hypervariable regions play a significant role in dictating the combining site structure together with the participation of framework region residues. The T cell receptor also has an antigen-binding site in the variable regions of its α and β (or γ and δ) chains.



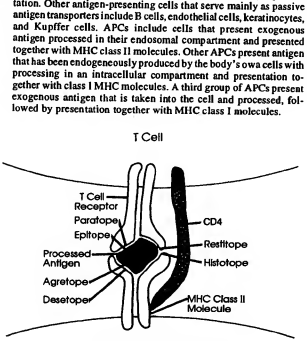
antibody deficiency syndrome
A few patients have been observed in which normal immunoglobulin levels are present, but the ability to mount an immune response to immunogenic challenge is impaired. This condition is associated with several separate disease states and might more properly be considered a syndrome. Some may present clinically as severe combined immunodeficiency with diminished cell-mediated immunity, lymphopenia, and infection by microorganisms of low pathogenicity. There are normal or even elevated numbers of plasma cells, and there may be no demonstrable T cell deficiency, both of which are in contrast to the usual clinical picture of severe combined immunodeficiency. These individuals may develop autoimmune reactions and show reduced numbers of lymphoid cells with surface immunoglobulin in the circulating blood. One possible explanation for normal immunoglobulin levels and an inadequate humoral immune response to antigenic challenge could be accounted for by a defect in clonal diversity, resulting in an antibody response to only a limited number of antigens. Some investigators



Antigen Presentation

Mononuclear phagocytes ingest proteins and split them into peptides in endosomes. These 8- to 10-amino acid residue peptides link to cell surface MHC class II molecules. For appropriate presentation, it is essential that peptides bind securely to the MHC class II molecules, since those that do not bind or are bound only weakly are not presented and fail to elicit an immune response. Following interaction of the presented antigen and MHC class II molecules with the $CD4^+$ T helper T cell receptor, the $CD4^+$ lymphocyte is activated, IL-2 is released, and IL-2 receptors are expressed on the $CD4^+$ lymphocyte surface. The IL-2 produced by the activated cell stimulates its own receptors, as well as those of monoaclear phagocytes, increasing their microbicidal activity. IL-2 also stimulates B cells to synthesize antibody. Whereas B cells may recognize a protein antigen in its native state, T lymphocytes recognize the peptides that result from antigen processing.

antigen-presenting cell (APC)
A cell that can process a protein antigen, break it into peptides, and present it in conjunction with class II MHC molecules on the cell surface where it may interact with appropriate T cell receptors. Macrophages, Langerhans cells, B cells, and dendritic reticulum cells process and present antigen to immunoreactive lymphocytes such as $CD4^+$, helper/inducer T cells. An MHC transporter gene-encoded peptide supply factor may mediate peptide antigen presentation. Other antigen-presenting cells that serve mainly as passive antigen transporters include B cells, endothelial cells, keratinocytes, and Kupffer cells. APCs include cells that present exogenous antigen processed in their endosomal compartment and presented together with MHC class II molecules. Other APCs present antigen that has been endogeneously produced by the body's own cells with processing in an intracellular compartment and presentation together with class I MHC molecules. A third group of APCs present exogenous antigen that is taken into the cell and processed, followed by presentation together with MHC class I molecules.



antigen recognition activation motif
A conserved sequence of 17 amino acid residues which contains two tyrosine-X-X-leucine regions. This motif is found in the cytoplasmic tails of the FcεRI-β and -α chains, the ζ and η chains of the TCR complex, the Igβ and Igα proteins of membrane IgD and IgM, and the α, δ, and ε chains of CD3. The antigen recognition activation motif is thought to be involved in signal transduction.

antigen-specific suppressor cells
Antigen-specific Ts cells can be demonstrated both in humoral and cell-mediated immunity. The Ts cells active in the humoral response can be generated after priming with the carrier to be used in subsequent experiments with hapten-carrier conjugates. These Ts cells can suppress the hapten-specific IgM and IgG antibody response if recipient animals are immunized with the hapten coupled to the homologous carrier. This type of suppression may have a differential effect on IgM and IgG antibody responses according to the time frame in which Ts cells are administered to the recipient animal. The early IgG response is relatively independent of T cell function and, accordingly, less susceptible to Ts cell effects. The late IgM and IgG responses are more T cell dependent and, accordingly, more susceptible to Ts cell inhibition.

antigen, supertypic
An inclusive term to describe an antigenic mosaic that can be separated into smaller, but related parts, called inclusions, splits, and subtypic antigens. Bw4 and Bw6 are classic examples of supertypic antigens. This implies that an antibody that detects Bw4 will also react with all antigens associated with Bw4 and an antibody that detects Bw6 will also react with all antigens associated with Bw6.

antigenic
An adjective that refers to the ability of a substance to induce an immune response and to react with its products, which include antibodies and T lymphocyte receptors. The term "antigenic" has been largely replaced by "immunogenic".

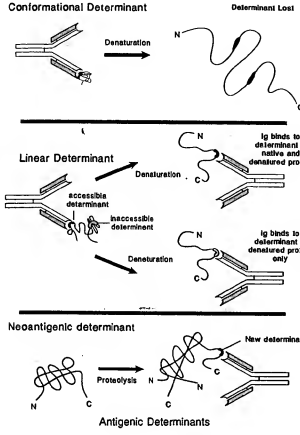
antigenic competition
The simultaneous injection of two closely related antigens may lead to suppression or a decrease of the immune response to one of them compared to the antigen's ability to elicit an immune response if injected alone. Proteins that are thymus-dependent antigens are the ones with which antigenic competition occurs. The phenomenon has been claimed to be due in part to the competition by antigenic peptides for one binding site on class II MHC molecules. Antigenic competition was observed in the early days of vaccination when it was found that the immune response of a host to the individual components of a vaccine might be less than if they had been injected individually.

antigenic deletion
Antigenic deletion describes antigenic determinants that have been lost or masked in the progeny of cells that usually contain them. Antigenic deletion may take place as a consequence of neoplastic transformation or mutation of parent cells, resulting in the disappearance or repression of the parent cell genes.

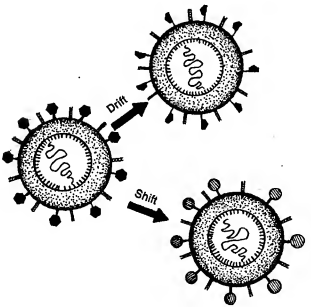
antigenic determinant (see facing page)
The site on an antigen molecule that is termed an epitope and interacts with the specific antigen-binding site in the variable region of an antibody molecule known as a paratope. The excellent fit between epitope and paratope is based on their three-dimensional interaction and noncovalent union. An antigenic determinant or epitope may also react with a T cell receptor for which it is specific. A lone antigen molecule may have several different epitopes available for reaction with antibody or T cell receptors.

antigenic diversion
The replacement of a cell's antigenic profile by the antigens of a different normal tissue cell. Used in tumor immunology.

antigenic drift
Spontaneous variation, as in influenza virus, expressed as relatively minor differences exemplified by slow antigenic changes from one year to the next. Antigenic drift is believed to be due to mutation of the genes encoding the hemagglutinin or the neuraminidase components. Antigenic variants represent those viruses that have survived exposure to the host's neutralizing antibodies. Minor alterations in a viral genome might occur every few years, especially in influenza A subtypes that are made up of H1, H2, and H3 hemagglutinins and N1 and N2 neuraminidases. Antigenic shifts follow point mutations of DNA encoding these hemagglutinins and neuraminidases.



Antigenic Determinants



Antigenic Drift and Shift

antigenic modulation
The loss of epitopes or antigenic determinants from a cell surface following combination with an antibody. The antibodies either cause the epitope to disappear or become camouflaged by covering it.

antigenic mosaicism
Antigenic variation first discovered in pathogenic *Neisseria*. It is the result of genetic transformation between gonococcal strains. This is also observed in penicillin resistance of several bacterial species where the resistant organism contains DNA from a host commensal organism.

antigenic profile
The total antigenic content, structure, or distribution of epitopes of a cell or tissue.

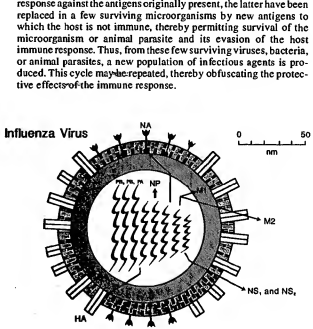
antigenic reversion
The change in antigenic profile characteristic of an adult cell to an antigenic mosaic that previously existed in the immature or fetal cell stage of the species. Antigenic reversion may accompany neoplastic transformation.

antigenic shift
A major antigenic change in which a strain with distinctive new antigens may appear, such as Asian or A2 influenza in 1957. Antigenic variants of type A influenza virus are known as subtypes. Influenza virus antigenic shift is attributable mainly to alterations in the hemagglutinin antigens with less frequent alterations in the neuraminidase antigens. The appearance of a new type A influenza virus signals the addition of a new epitope, even though several original antigenic determinants are still present.
In contrast to antigenic drift, antigenic shift involves a principal alteration in a genome attributable to gene rearrangement between two related microorganisms. Since antigenic shift involves the acquisition of totally new antigens against which the host population is not immune, this alteration may lead to an epidemic of significant proportions.

antigenic sin, doctrine of original
When the immune response against a virus, such as a parental strain, to which an individual was previously exposed is greater than it is against the immunizing agent, such as type A influenza virus variant, the concept is referred to as the "doctrine of original antigenic sin".

antigenic transformation
Antigenic transformation refers to changes in a cell's antigenic profile as a consequence of antigenic gain, deletion, reversion, or other process.

antigenic variation
Antigenic variation represents a mechanism whereby selected viruses, bacteria, and animal parasites may evade the host immune response, thereby permitting antigenically altered etiologic agents of disease to produce a renewed infection. The variability among infectious disease agents is of critical significance in the development of effective vaccines. Antigenic variation affects the surface antigens of the viruses, bacteria, or animal parasite in which it occurs. By the time the host has developed a protective immune response against the antigens originally present, the latter have been replaced in a few surviving microorganisms by new antigens to which the host is not immune, thereby permitting survival of the microorganism or animal parasite and its evasion of the host immune response. Thus, from these few surviving viruses, bacteria, or animal parasites, a new population of infectious agents is produced. This cycle may be repeated, thereby obfuscating the protective effects of the immune response.



Antigen Variation

enzyme labeling
A method such as the immunoperoxidase technique that permits detection of antigens or antibodies in tissue sections by chemically conjugating them to an enzyme. By then staining the preparation for the enzyme, antigen or antibody molecules can be located. Refer to immunoperoxidase method.

enzyme-linked immunosorbent assay (ELISA)
An immunoassay which employs an enzyme linked to either antiimmunoglobulin or antibody specific for antigen and detects either antibody or antigen. This method is based on the sandwich or double-layer technique, in which an enzyme rather than a fluorochrome is used as the label. In this method, antibody is attached to the plastic tube, well, or bead surface to which the antigen-containing test sample is added. If antibody is being sought in the test sample, then antigen should be attached to the plastic surface. Following antigen-antibody interaction, the enzyme-antiimmunoglobulin conjugate is added. The ELISA test is read by incubating the reactants with an appropriate substrate to yield a colored product that is measured in a spectrophotometer. Alkaline phosphatase and horseradish peroxidase are enzymes that are often employed. ELISA methods have replaced many radioimmunoassays because of their lower cost, safety, speed, and simplicity in performing.

enzyme-multiplied immunoassay technique
An immunoassay used to monitor therapeutic drugs such as antitumor, antiepileptic, antiasthmatic, and metabolites of cocaine and of other agents subject to abuse. It is a one phase, competitive enzyme-labeled immunoassay.

eosinophil
A polymorphonuclear leukocyte identified in Wright- or Giemsa-stained preparations by staining of secondary granules in the leukocyte cytoplasm as brilliant reddish-orange refractile granules. Cationic peptides are released from these secondary granules when an eosinophil interacts with a target cell and may lead to death of the target. Eosinophils make up 2 to 5% of the total white blood cells in man. After a brief residence in the circulation, eosinophils migrate into tissues by passing between the lining endothelial cells. It is believed that they do not return to the circulation. The distribution corresponds mainly to areas exposed to external environment, such as skin, mucosa of the bronchi, and gastrointestinal tract. Eosinophils are elevated during allergic reactions, especially type I immediate hypersensitivity responses, and are also elevated in individuals with parasitic infestations.

Eosinophil with Segmented Nucleus

eosinophil chemotactic factor
Mast cell granule peptides that induce eosinophil chemotaxis. These include two tetrapeptides: Val-Gly-Ser-Glu and Ala-Gly-Ser-Glu. Histamine also induces eosinophil chemotaxis.

eosinophilia
Elevated number of eosinophil in the blood. It occurs in immediate, type I hypersensitivity reactions, including anaphylaxis and atopy, and is observed in patients with parasitic infestations, especially by nematodes.

eosinophilic granuloma
A subtype of a macrophage lineage (histiocytosis X) tumor that contains eosinophils, especially in bone.

eosinophilic myalgia syndrome (EMA)
An intoxication syndrome observed in persons in the U.S. that appeared linked to the consumption of L-tryptophan, proposed by some health advocates as an effective treatment for various disorders such as insomnia, premenstrual syndrome, etc. It was associated with a strain of *Bacillus amyloliquefaciens* employed to produce tryptophan commercially. The inducing agent was apparently an altered amino acid, DTAA (ditryptophan aminal acetaldehyde), a contaminant introduced during manufacture. Clinical manifestations of the syndrome include arthralgia, myopathy, angioedema, alopecia, mobileform rash, oral ulcers, sclerodermoid lesions, restricted lung disease, fever, lymphadenopathy, and dyspnea, among other features. There was a significant eosinophilia. IL-5 was believed to have a role in injury to tissues. Histopathologic examination revealed arteriolitis and sclerosing skin lesions.

epibody
An antiidiotypic antibody reactive with an idiotype of a monoclonal, human anti-IgG autoantibody as well as with human IgG Fc region. These antibodies identify an antigenic determinant associated with the sequence Ser-Ser-Ser. The ability of an epibody to identify an epitope shared by a rheumatoid factor idiotope and an Fc γ epitope demonstrates that this variiarity of antiidiotypic antibody may function as a rheumatoid factor.

epidermal growth factor (EGF)
A trisulfated polypeptide consisting of 53 residues. It is a member of the tyrosine kinase family and is related to the *erb* oncogene. EGF has multiple functions that include stimulation of the mitogenic response, facilitation of wound healing, and many other functions. It is present in the saliva of rodents.

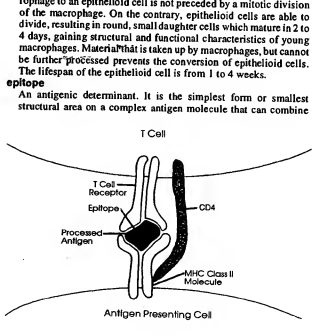
epidermal growth factor receptor (EGFR)
A 400-amino acid protein found in T cell carcinomas, neurons, cornea, fibroblasts, T lymphocytes, liver, vascular endothelium, and placenta. EGFR measurement is used to judge the aggressiveness of such neoplasia as breast cancer.

epithelial membrane antigen (EMA)
A marker that identifies, by immunoperoxidase staining, most epithelial cells and tumors derived from them, such as breast carcinomas. However, various nonepithelial neoplasms, such as selected lymphomas and sarcomas, may express EMA also. Thus, it must be used in conjunction with other markers in tumor identification and/or classification.

epithelial thymic-activating factor (ETAF)
An epithelial cell-culture product capable of facilitating thymocyte growth. The activity is apparently attributable to interleukin-1.

epithelioid cells
The epithelioid cell is a particular type of cell characteristic of some types of granulomas such as in tuberculosis, sarcoidosis, leprosy, etc. The cell has poorly defined cellular outlines; cloudy, abundant eosinophilic cytoplasm; and an elongated and pale nucleus. By electron microscopy, the cell shows a few short and slender pseudopodia and well-developed cellular organelles. Mitochondria are generally elongated, the Golgi complex is prominent, and lysosomal dense bodies are scattered throughout the cytoplasm. Strands of endoplasmic reticulum, free ribosomes, and fibrils are present in the ground substance.
The epithelioid cell derives from the monocyte-macrophage system. Peripheral blood monocytes made adherent to cellophane strips and implanted into the subcutaneous tissue of an experimental animal develop into epithelioid cells. Conversion of the macrophage to an epithelioid cell is not preceded by a mitotic division of the macrophage. On the contrary, epithelioid cells are able to divide, resulting in round, small daughter cells which mature in 2 to 4 days, gaining structural and functional characteristics of young macrophages. Materia?thät is taken up by macrophages, but cannot be further processed prevents the conversion of epithelioid cells. The lifespan of the epithelioid cell is from 1 to 4 weeks.

epitope
An antigenic determinant. It is the simplest form or smallest structural area on a complex antigen molecule that can combine



with an antibody or T lymphocyte receptor. It must be at least 1 kD to elicit an antibody response. A smaller molecule such as a hapten may induce an immune response if combined with a carrier protein molecule. Multiple epitopes may be found on large nonpolymeric molecules. Based on X-ray crystallography, epitopes consist of prominently exposed "hill and ridge" regions that manifest surface rigidity. Antigenicity is diminished in more flexible sites.

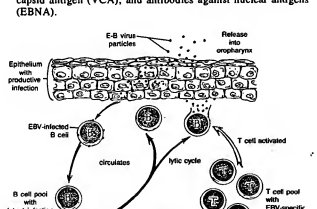
epitype
A family or group of related epitopes.

EPO
Refer to erythropoietin.

Epstein-Barr immunodeficiency syndrome
Duncan's X-linked immunodeficiency. This is an X-linked or autosomal recessive condition associated with congenital cardiovascular and central nervous system defects. Patients may develop infectious mononucleosis that is fatal. There is aplasia of the bone marrow, agammaglobulinemia, and agranulocytosis, and the response to mitogens and antigens by B cells is greatly diminished. Natural killer cell activity is decreased, and T cells are abnormal. Patients may develop hepatitis, B cell lymphomas, and immune suppression.

Epstein-Barr nuclear antigen
A molecule that occurs in B cells before virus-directed protein can be found in nuclei of infected cells. Thus, it is the earliest evidence of Epstein-Barr virus infection and can be found in patients with conditions such as infectious mononucleosis and Burkitt's lymphoma.

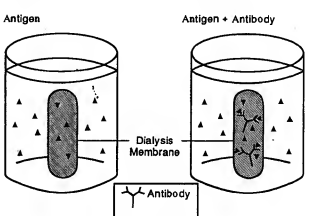
Epstein-Barr virus (EBV)
A DNA herpes virus linked to aplastic anemia, chronic fatigue syndrome, Burkitt's lymphoma, histiocytic sarcoma, hairy cell leukemia, and immunocompromised patients. EBV may promote the appearance of such lymphoid proliferative disorders as Hodgkin's and non-Hodgkin's lymphoma, infectious mononucleosis, nasopharyngeal carcinoma, and thymic carcinoma. It readily transforms B lymphocytes and is used in the laboratory for this purpose to develop long-term B lymphocyte cultures. Antibodies produced in patients with EBV infections include those that appear early and are referred to as EA, antibodies against viral capsid antigen (VCA), and antibodies against nuclear antigens (EBNA).



Epstein-Barr Virus-Host Interactions

equilibrium constant
A constant that expresses the state of equilibrium reached by molecules in a reversible reaction such as A + B ⇌ AB. The equilibrium constant may be expressed as a dissociation constant, $K_D = [A][B]/[AB]$, or an association constant, $K_A = [AB]/[A][B]$.

equilibrium dialysis
Equilibrium dialysis was developed for the study of primary antibody-hapten interactions. The basis for the technique is as follows. Two cells are separated by a semipermeable membrane, allowing the free passage of hapten molecules, but not larger antibody molecules. At time zero (t_0), there is a known concentration of hapten in cell A and antibody in cell B. Hapten from cell A will then diffuse across the membrane into cell B until, at equilibrium, the concentration of free hapten is the same in both cells A and B; that is, the rate of diffusion of hapten from cell A to B is the same as that from cell B to A. Though the concentrations of free hapten are the same in both cells, the total amount of hapten in cell B is greater because some of the hapten is bound to the antibody molecules. A series of experiments are preformed varying the starting amount of hapten concentration, while keeping antibody concentration constant.



Equilibrium Dialysis

equivalence (or equivalence point)
In a precipitation reaction *in vitro*, the antigen to antibody ratio where maximal precipitation takes place. The supernatant should not contain free antigen or free antibody, as all of the antigen and antibody molecules react with one another at equivalence.

erbA, erbB
Oncogenes expressing tyrosine kinase activity. They are similar in structure to the avian erythroblastosis retrovirus. They code for cell membrane proteins. *erbB* is expressed in breast and salivary gland carcinomas and is a truncated version of epidermal growth factor receptor. Increased copy numbers of the c-*erbB*-2 (HER-2/neu) gene suggest an unfavorable prognosis for carcinoma of the breast.

ergotype
A T lymphocyte being activated. The injection of antiergotype T cells blocks full-scale activation of T lymphocytes and may prevent development of experimental autoimmune disease in animal models. An example is experimental allergic encephalomyelitis (EAE), in which antiergotype T lymphocytes may prevent full T lymphocyte activation.

erythema
Redness of the skin caused by dilatation of blood vessels lying near the surface.

erythema marginatum
Immune complex-induced vasculitis in the subcutaneous tissues associated with rheumatic fever.

erythema multiforme
Skin lesions resulting from subcutaneous vasculitis produced by immune complexes. They are frequently linked to drug reactions. The lesions are identified by a red center encircled by an area of pale edema which is encircled by a red or erythematous ring. This gives it a target appearance. Erythema multiforme usually signifies a drug allergy or may be linked to systemic infection. Lymphocytes and macrophages infiltrate the lesions. When there is involvement and sloughing of the mucous membranes, the lesion is considered quite severe and even life threatening. This form is called the Stevens-Johnson syndrome.